A STUDY ON PREVALENCE OF OVER WEIGHT AND OBESITY AMONG WOMEN AGED 20 YEARS AND ABOVE IN AN URBAN SLUM OF CHENNAI

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M.D. BRANCH XV

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CERTIFICATE

This is to certify that the dissertation on **'A study on prevalence of overweight and obesity among women aged 20 years and above in an urban slum of Chennai'** is a bonafide work carried out by **Dr.R.ANURADHA**, post-graduate student in Institute of Community Medicine, Madras Medical College, Chennai–3 during 2007-2010, under my guidance and supervision in partial fulfillment of the requirement laid down by The Tamilnadu Dr.M.G.R. Medical University, M.D. Community medicine, Branch-XV Degree examination to be held in March 2010.

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LIST OF CONTENTS

ANNEXURE 1

QUESTIONNAIRE

PREVALENCE OF OVERWEIGHT AND OBESITY AMONG WOMEN AGED 20 YEARS AND ABOVE IN AN URBAN SLUMOF CHENNAI

Part I

1. Name:

2..Age

3. Religion

1) Hindu 2) Muslim 3) Christian

4. Education

1) illiterate 2) primary school 3) middle school
4) high school 5)higher secondary / post high school diploma `
6) graduate/post graduate

5.Occupation

1) unemployed 2)unskilled worker 3)semi skilled worker
4)skilledworker 5) clerk/ shop owner 6)semiprofessional
7)professiona 8) homemaker 9)student 10)retired /old age dependant

6. Marital status:

1) Unmarried 2) Married 3) Separated 4) Divorced 5) Widowed

7. Type of Family:

1) Nuclear 2) Joint 3) Living alone

8.Socio Economic Status

1) upper 2) upper middle 3) lower middle
4) upperlower 5) lower

9.Personal habits

1)smoking 2)alcohol 3)betel nut chewing 4)tobacco chewing
5)snuff 6)none.

10) Menstrual status 1)Menstruating 2) Attainted Menopause

11) Number of Pregnancies……
12). Any history of medications?. .....

13).Any family history of overweight? 1)yes 2) no

PART II
Diet:

14). What is your diet pattern? 1)vegetarian 2)non vegetarian

15). If nonvegetarian how frequent do you of consume nonveg in a week ? ……..

16). Intake of cereals _ gms/day

17). Intake of oil - ml/day

18). Intake of sugar - gms/day

19) What type of cooking oil do you use?

1) palmoil 2) coconut oil 3) ground nut oil

4) sunflower oil 5)others

20) How frequent do you of eat vegetables in a week ? …….

21) How frequent do you eat fruits in a week?.....

22)How frequent do you consume milk /milk products in a week ? ….

23) How frequent do you consume pulses in a week ? ……

PART III
PHYSICAL ACTIVITY

24). How many hours of household activities do you do in a day?.....

25) If going to job how many hours do you spend at job in a day? ……..

26). What is the nature of your job? …….

27). Do you exercise apart from your daily activities? 1)Yes 2) no

28). If yes, what type of exercise you do?
1) walking 2)cycling 3)others

29)What is the duration of exercise / day ? 1)<30 min 2)≥ 30 min

30). How many hours do you sleep during night ? …….

31) Do you sleep post lunch? 1)yes 2)no

32).How many hours in a day do you spend watching television? ……..

PART IV
33**)** Physical Measurements**:**

Height	in meters(m)
Weight	in kilograms (Kg)
BMI	kg/m^2
Waist Circumference	cms

ANNEXURE II

MODIFIED KUPPUSWAMY'S SOCIOECONOMIC STATUS SCALE

S.No	(A) Education	Score
1	Profession or Honours	**7**
2	Graduate or post graduate	**6**
3	Intermediate or post high school diploma	**5**
4	High school certificate	**4**
5	Middle school certificate	**3**
6	Primary school certificate	**2**
7	Illiterate	**1**

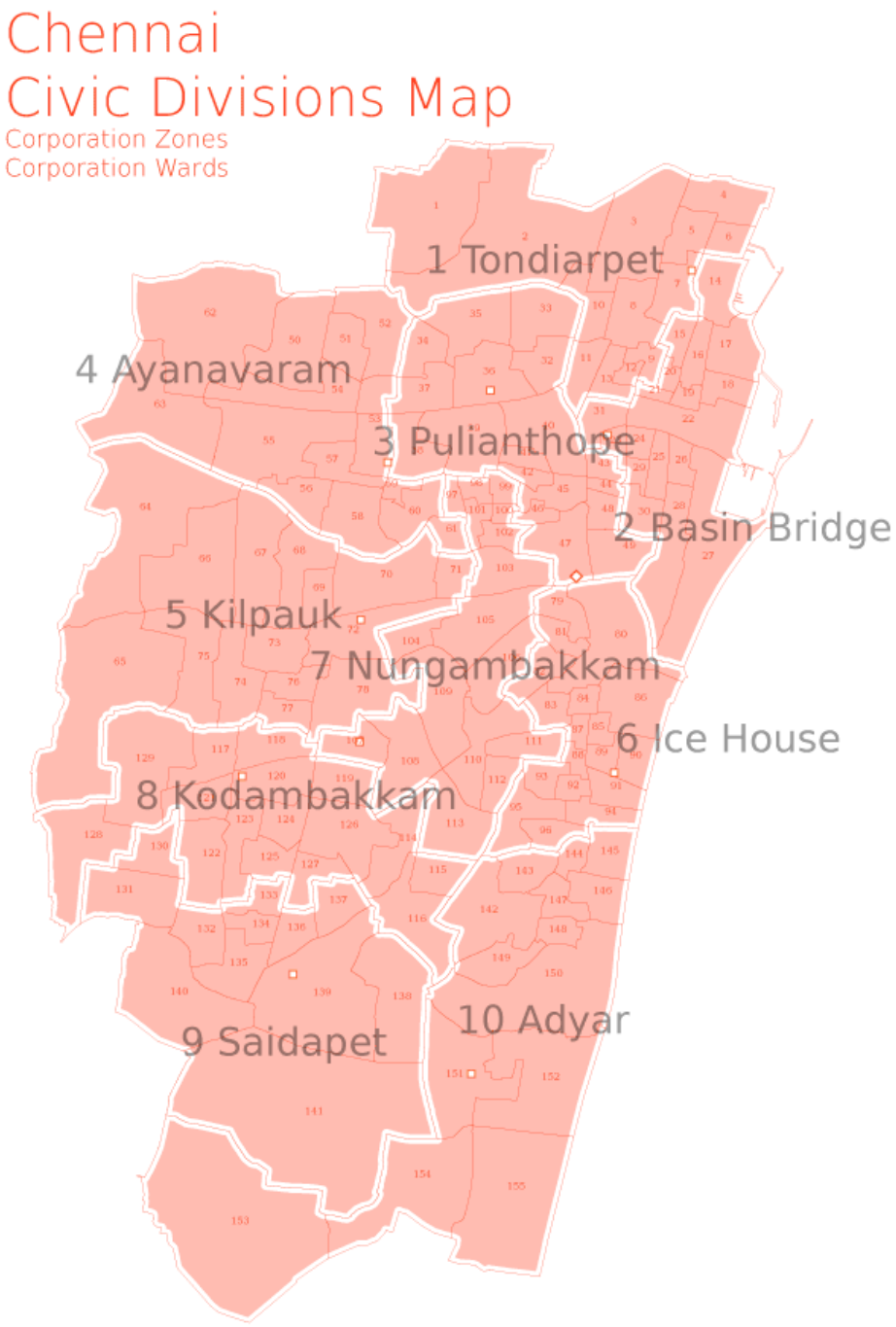
S.No	(B) Occupation	Score
1	Profession	**10**
2	Semi-Profession	**6**
3	Clerical, Shop-owner, Farmer	**5**
4	Skilled worker	**4**
5	Semi-skilled worker	**3**
6	Unskilled worker	**2**
7	Unemployed	**1**

S.No	(C) Family income per month(in Rs)- modified for 2007	Score
1	≥19575	**12**
2	9788-19574	**10**
3	7323- 9787	**6**
4	4894- 7322	**4**
5	2936-4893	**3**
6	980-2935	**2**
7	≤979	**1**

Total Score	Socioeconomic class
26-29	Upper (I)
16-25	Upper Middle (II)
11-15	Middle Lower middle (III)
5-10	Lower Upper lower (IV)
<5	Lower (V)

ANNEXURE III

ZONAL MAP OF CHENNAI CORPORATION



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Nfs;tpg; gbtk;;

gFjp - I

1. ngah; :

2. taJ :

3. kjk; : 1. ,e;J 2. K];yPk; 3. fpwp];jth;

4. fy;tp : 1. fy;tpapwptpy;yhjth; 2. Muk;gf;fy;tp 3. eLepiyf;fy;tp 4. cah;epiyf;fy;tp 5. Nky;epiyf;fy;tp 6. gl;lg;gbg;G

5. njhopy; : 1. Ntiy mw;wth; 2. El;gk; rhuh njhopyhsp

3. gFjp El;gk; rhh;e;j njhoyhsp

4. El;gk; rhh;e;j njhoyhsp

5. fil tpahghhp / cjtpahsh;

6. ,ilg;gl;l me;j];Js;s njhopy; El;g ty;Ydh;

7. cah;e;j me;j];Js;s njhopy; El;g ty;Ydh;

8. ,y;yjurp

9. khzth;

10. Xa;T ngw;wth; / gpwh; rhh;e;jth;

6. jpUkz epiy : 1. kzkhfhjth; 2. kzkhdth;

3. jdpj;jpUg;gth; 4. tpthfuj;jhdth;

5. tpjit

7. FLk;g tif : 1. jdpf;FLk;gk; 2. $l;Lf;FLk;gk;

2. jdpj;J tho;gth;

8. r%f nghUshjhu epiy :1. cah;e;jepiy 2. cah; ,il epiy

3. jho; ,ilepiy 4. cah;jho;epiy

5. jho;epiy

9. jdpg;gl;l gof;ftof;fq;fs;: 1. Gifgpbj;jy; 2. kJ

3. ntw;wpiyg;ghf;F

4. Gifapiy 5. -USö£õi

6. GxÄ® CÀø»

10. khjtplh´ {ø» : 1. ©õuÂhõ´ Á¸QÓx

2. khjtplha; ,Wjpahf epd;Wtpl;lx

11. ePq;fs; vj;jid Kiw fUj;jhpj;Js;sPh;fs; ? ----------

12. kUe;J H÷uÝ® cl;nfhs;fpd;wPh;fsh? 1. Mk; 2.,y;iy

13. mjpf vil Fwpj;j FLk;g tuyhW cs;sjh? 1.Mk; 2.,y;iy

gFjp .II

czT

14. cq;fs; czT gof;fk; vd;d ? 1. irtk; 2.mirtk;

15. mirtk; vdpy; thuk; vj;jid Kiw cz;gPh;fs;? ----------

16. jpdrhp jhdpa tiffs; cl;nfhs;Sk; msT---------- fpuhk;

17. jpdrhp vz;nza; cl;nfhs;Sk; msT ---------- kpy;yp

18. jpdrhp rh;f;fiu cl;nfhs;Sk; msT ---------- fpuhk;

19. rikaYf;F vd;d tifahd vz;nza; gad;gLj;JtPh;fs;?

1. ghkhapy; 2. Njq;fha; vz;nza; 3. flnyz;nza;

4. #hpafhe;jp vz;nza; 5. kw;wit

20. thuk; vj;jid Kiw fha;fwp cz;gPh;fs;? ----------

21. thuk; vj;jid Kiw goq;fs; cz;gPh;fs;? ----------

22. thuk; vj;jid Kiw ghy; kw;Wk ghy; nghUl;fs; cl;nfhs;tPh;? ----------

23. thuk; vj;jid Kiw gUg;G tiffs; cl;nfhs;tPh;;? ----------

gFjp . III

clw;nra;jpwd;

24.; jpdrhp vj;jid kzpNeuk; ePq;fs; tPl;L Ntiyfs; nra;tPh;fs;? ----------

25. gzp nra;gtuhapd; jpdrhp cq;fSila gzp vj;jid kzp Neuk;? --------

26. cq;fs; gzpapd; jd;ik vd;d?

27. ePq;fs; jpd Ntiyfs; jtpu VjhtJ clw;gapw;rp Nkw;nfhs;tPh;fsh?

1. Mk; 2. ,y;iy

28. vt;tifahd clw;gapw;rp nra;tPh;fs;? 1. elg;gJ

2. kpjptz;b xl;Ljy;
3. kw;wit

29. clw;gapw;rp Nkw;nfhs;tjhdhy; jpdrhp vj;jid kzp Neuk; nra;tPh;fs; ?

1. < 30 epkplk; 2. ≥ 30 epkplk;

30. jpdrhp ,utpy; vj;jid kzp Neuk; Jhq;FtPh;fs; ? ----------

31. kjpa cztpw;F gpd; Jhq;FtPh;fsh ? 1. Mk; 2. ,y;iy

32. jpdrhp vj;jid kzp Neuk; njhiyf;fhl;rp fhz;gPh;fs;? --------

gFjp . IV

33. msT

cauk;	kP
vil	fp.fp
vil / cauk; ^{2}	fp.fp. / kP ^{2}

,ilr;Rw;wsT nr.kP.

ANNEXURE IV

LIST OF ZONES IN CHENNAI CORPORATION:

1. Tondiarpet
2. Basin bridge
3. Pulianthope
4. Ayanavaran
5. Kilpauk
6. Ice house
7. Nungambakkam
8. Kodambakkam
9. Saidapet
10. Adyar

LIST OF SLUMS IN ZONE V

S.NO	NAME OF THE SLUM
1.	Old Thirumangalam
2.	Nehru Nagar
3.	T.V .Nagar
4.	Koyythoppu
5.	Empar Naidu Street
6.	Thiru Venkatachalam Street
7.	East Erikkarai Street
8.	Barathinagar
9.	Annai Sathya Nagar
10.	Semathamman Nagar
11.	Indira Nagar
12.	Gandhi Nagar
13.	Gangai Amman Koil Street
14.	New Colony
15.	Thangal Erikarai
16.	Othai Pillayar Koil Street
17.	Moovendar Nagar
18.	Bajanai Koil Street
19.	Indira Nagar
20.	Brewery Road
21.	Dr.Radhakridhnan Nagar
22.	Mel Naduvangarai
23.	Mgr Colony
24.	Ponvel Pillai Thottam
25.	A.S.Nagar
26.	Muthumariamman Colony
27.	Manjakollai Street
28.	Thiruveedi Amman Koil Street
29.	Kathiravan Colony
30.	Gajalakshmi Colony
31.	Tamilar Nagar
32.	V.O.C.Colony
33.	V.O.C.4-6th Street
34.	Rani Anna Nagar
35.	Kamaraj Nagar
36.	Jothiammal Nagar

S.NO	Name Of The Slum
37.	Rani Anna Nagar(Old Bus Stand)
38.	Semman Pettai
39.	Karumbu Thottam
40.	Ladder Gate
41.	Sastri Nagar
42.	Pulla Puram
43.	Namachivaya Puram
44.	Jothiammal Nagar
45.	Nehru Park Slum Clearance
46.	Valliamal Koil Street
47.	Kakkan Nagar
48.	Nalla Muthumari Nagar
49.	Indira Nagar
50.	M.H.Colony
51.	Indira Nagar First Street
52.	Dr. Subha Rao Street
53.	Ashoka Nagar
54.	P.P. Nagar
55.	V.A.Nagar
56.	R.A.Nagar
57.	Annai Sathya Nagar
58.	T.V. Amman Koil Street
59.	Padavattamman Street
60.	East Namachivayapuram
61.	West Namachivayapuram
62.	Bajanai Koil Street
63.	Perumal Koil Street
64.	Appasamy Street
65.	Jayalakshmi Puram
66.	Nehru Street

ANNEXURE V

ABBREVIATIONS

BMI	-	Body Mass Index
CHD	–	Coronary Heart Disease
CI	–	Confidence Interval
df	–	Degree Of Freedom
ICMR	-	Indian Council Of Medical Research
HDL	–	High Density Lipoprotein
NCD	–	Non Communicable Disease
NFHS	–	National Family Health Survey
OR	-	Odds Ratio
SD	-	Standard Deviation
SPSS	-	Statistical Package For Social Science
WHO	-	World Health Organisation
WHR	-	Waist Hip Ratio

INTRODUCTION

According to World Health Organisation (WHO) the global prevalence of overweight and obesity has reached epidemic proportions.[1]

The World Health Organization has described obesity as one of today's most neglected public health problems. Following the increase in adult obesity, the proportion of children and adolescents who are overweight and obese have also been increasing[2] .Rapidly changing diets and lifestyles are fueling the global obesity epidemic.[3]

According to recent estimates, there are more than one billion overweight people worldwide,and some 300 million of these are estimated to be obese.[4]

Once considered a problem related to affluence, obesity is now fast growing in many developing countries.[3]

Even in countries like India, which are typically known for high prevalence of undernutrition, significant proportions of overweight and obese now coexist with the undernourished .[5]

Problems of overweight and obesity are caused by chronic imbalance between energy intake and actual energy needs of the body. In

many developing countries, with increasing urbanization, mechanization of jobs and transportation, availability of processed and fast foods, and dependence on television for leisure, people are fast adopting less physically active lifestyles and consuming more energy-dense, nutrient-poor diets.[3,5,6]

As a result, overweight and obesity and associated chronic health problems, such as diabetes, hypertension, cardiovascular disease, cancer, and muscluloskeletal disorders, are increasing rapidly, particularly among the middle-class, urban populations.[3,7 ,8, 9]Overweight and obesity are most closely related to non-insulin dependent diabetes mellitus or Type 2 diabetes.It is estimated that more than two-thirds of all diabetes mellitus cases can be linked to overweight conditions[10.]

WHO estimates that approximately 58% of diabetes mellitius, 21% of ischaemic heart disease, and 8-42% of certain cancers can be attributed to body mass index (BMI) above 21 kg/m2.[4]

Overweight conditions have been linked with gallstones and liver abnormalities[11] , low back pain, osteoarthritis of the hands and wrist[12], reduced lung function, airways hyperresponsiveness, and asthma symptoms[13]; and sleep apnea[14].

Obesity has also been associated with menstrual dysfunction[15,16], reproductive disorders including infertility[1718] ,increased abortion rates[19] and pregnancy complications and adverse pregnancy outcomes[20,21].

WHO typically defines adult overweight as a body mass index (BMI) of 25.0−29.9 kg/m2; and adult obesity as a BMI ≥ 30.0 kg/m2. However, it is observed that in Asian populations health risks associated with overweight and obesity occur at lower levels of BMI than in north America or Europe,[22,23] and it is now being suggested that lower cutoff points for BMI be used to categorize overweight and obese conditions for Asian populations.[24]

In the past, governments in many developing countries with high levels of under nutrition and high prevalence of communicable diseases have paid little attention to the problems of overweight and obesity. Now with rapidly growing obesity epidemic and associated chronic diseases the situation is beginning to change.

OBJECTIVES

1. To find out the prevalence of overweight and obesity among women aged 20 years and above in an urban slum of Chennai.

2. To identify the risk factors associated with overweight and obesity in the above study population .

JUSTIFICATION

1. Obesity and overweight are creating a global epidemic which is in need of grave attention.

2. They are the main risk factors for many Non-communicable Diseases (NCD).

3. Unlike the communicable diseases, prevention is economical and easy at an early stage with change occurring in the form of lifestyle modification at an individual level with increasing awareness.

4. Secondary and tertiary complications of obesity place a huge economic burden both on the individual and the country, Hence prevention is the key.

5. Once considered a problem related to affluence, obesity is now fast growing in many developing countries.

6. In India overweight and obesity are more than three times higher in urban than rural areas and more common among women[25] . Prevalence of physical inactivity and obesity increased from rural to urban population with urban slum being similar to urban population with regard to prevalence of risk factors. Women were

worse off as compared to men in regards to diet, physical activity and obesity and this gender differential widened as we moved from rural to urban setting.[26]

7. Burden of the slum population, and magnitude of their health problems are on the rise. There is rising prevalence of obesity and other non communicable diseases in the slum population.[27]

8. There are not many studies about the prevalence of overweight and obesity in urban slums of South India.

REVIEW OF LITERATURE

Obesity may be defined as an abnormal growth of the adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in fat cell number (hyperplastic obesity) or a combination of both.[28] Overweight refers to increased body weight in rela-tion to weight, when compared to the same standard of acceptable or desirable weight.[29]

The operational definitions of obesity and overweight however are based on body size (BMI) which is closely correlated with body fat[24].

Prevalence

Obesity has reached epidemic proportions globally, with more than 1 billion adults overweight - at least 300 million of them obese - and is a major contributor to the global burden of chronic disease and disability.

About 20-40% of the adults and 10 – 20% of children and adolescents are obese in developed countries.[30]

Prevalence of overweight/obesity in India among urban women aged 15 -49 years is 28.9% according to national family health service -3 (NFHS-3). Overweight and obesity are more than three times higher in urban than rural areas and more common among women[25] .

The urban cities in the country are facing high prevalence of obesity. In 2000, a multi centric study[31]involving seven urban cities (Chennai, Bangalore, Hyderabad, Mumbai, Culcutta and New Delhi) in India among the age group of 20-40 and >=40 age group showed a prevalence of 31% and 38% respectively

Few studies were carried out comparing different socio economic groups. In urban Chennai, Mohan et al[32] reported 20% prevalence of overweight/obesity among men and women aged 20 years and above and belonging to the low socio economic group while, the middle socio economic group had a higher prevalence (35%) during 1996-97.

Some studies addressed the gradients of obesity among slum /non-slum groups. Indian council of medical research (ICMR) Task force study among dwellers of urban slum in Delhi showed a prevalence of 20%[33] , as compared to urban and rural prevalence of 48% and 12% respectively. Misra et al reported 25% prevalence of obesity in the slums of Delhi.[34]

In a study of surveillance of risk factor of noncommunicable disease prevalence of obesity in periurban/slum of Chennai reported a prevalence of 28.9%.[35]

Epidemiological determinants

1. Age –obesity can occur at any age, and generally increases with age. Infants with excessive weight gain have an increased incidence of obesity in later life [36]. About one third of obese adults have been so since child hood[28].

2. Sex –women have higher rates of obesity than men,although men may have higher rates of overweight. Recent evidence indicate woman's BMI increases with successive pregnancies,on an average about 1 kg per pregnancy.On the other hand in many developing countries consecutive pregnancies at short intervals are often associated with weight loss rather than weight gain.[37]In Framingham ,USA study,women gain most weight between 45 and 49 years of age.[38]

3. Genetic Factors –twin studies have shown close correlation between weights of identical twins even when they are reared in dissimilar environments.[39]

4. Physical Inactivity- Physical activity is defined as any body movement that results in the expenditure of energy. It includes sports and activities such as walking, cycling, playing, skating,

cleaning the house, dancing or climbing the stairs. It is thus part of daily life.

There is international consensus on the value of regular moderate physical activity. This can be provided by at least 30 minutes of physical activity daily. The total of 30 minutes does not have to be performed in a single session; it can be accumulated throughout the day[40]. As a result of economic changes and increased mechanization, the prevalence of physical inactivity is increasing in India, particularly in urban areas, to levels comparable with the West[41]. In the Interheart study, the prevalence of leisure time physical activity was substantially lower among South Asians compared with the rest of the world[42]. Regular physical activity reduces the risk of obesity, blood lipid abnormalities, hypertension, and non-insulin dependent diabetes mellitus[43], and has been shown to reduce substantially the risk of coronary heart disease (CHD). Conversely, measures of sedentary lifestyles or physical inactivity have been associated with a 1.5 to 2.4 fold elevation in CHD risk[44] A recent hospital-based case control study from two urban centers in India suggested that daily moderate intensity physical activity (e.g., the equivalent of briskly walking 35- 40 min per day) is associated with a 55 per cent lower risk for CHD[45].

Sedentary lifestyle particularly sedentary occupation and inactive recreation such as watching television promotes weight gain ,physical activity and physical fitness are important modifiers of mortality and morbidity related to overweight and obesity.[46]Reduced energy out put without compensatory decrease habitual energy intake is a major cause of obesity.There is evidence that regular physical exercise increases the concentration of HDL(high density lipoprotein)[47] and decreases both body weight and blood pressure which are beneficial to cardiovascular health.

5. Eating Habits –eating habits (eating in between meals, preference to sweets refined foods and fats) are established very early in life. Food composition, periodicity with which it is taken, and the amount of energy derived from it are all relevant to the aetiology of obesity. More energy dense food than needed may lead to prolonged post prandial hyper lipidemia and to deposition of triglycerides in adipose tissue resulting in obesity[48]. Television And print media is playing an important role in producing obesity by heavy advertisement of fastfood outlets of energy dense , micronutrient poor food and beverages of multinational corporations, which influence the daily eating habits.The consumer

demand by itself may be influenced by advertising ,marketing ,culture ,fashion and convenience.

6. Socioeconomicstatus –In developed countries the occurrence of obesity is higher in the lower socio-economic groups, whereas in developing countries this relationship is reversed.[49 ,50]

7. Psychosocial factors (emotional disturbances)are involved in the etiology of obesity.

8. Endocrine factors – these may be involved in occasional cases e.g Cushings ,growth hormone deficiency

9. Drugs like oral contraceptives, steroids etc can promote weight gain.

10. Family tendency-obesity frequently runs in families (obese parents frequently having obese children), but this is not necessarily explained solely by the influence of genes.

11. Alcohol – a recent review of studies concluded that alcohol consumption and adiposity was generally positive for men and negative for women[51]

12. Smoking-in most of the studies smokers weigh somewhat less than non smokers

13. Ethnicity –ethnic groups in many industrialized countries are susceptible to the development of obesity and its complications. Evidence suggest that this may be due to genetic predisposition that becomes apparent when such groups are exposed to a more affluent life style.

Measurement And Classification

Height and weight are the most simple and commonly used measures. A number of weight-for-height indices have been developed of which the body mass index is the most widely used. It is defined as the weight in kilograms divided by the square of the height in metres (kg/ m^2). Although it can sometimes misclassify total body fat content, BMI generally correlates highly with adiposity. Therefore BMI, which is easy to calculate, has been recommended as the measure of obesity for adults to be used in all studies.[52]

There are now evidence that the increased risks of co-morbidities with obesity occurs at a lower BMIs in Asians[53] than in north America or Europe, and it is now being suggested that lower cutoff points for BMI

be used to categorize overweight and obese conditions for Asian populations.

Classification Of Weight By BMI In Adult Asians[24]

Classification	BMI (kg/ m^2)
Underweight	<18.5
Normal Range	18.5 – 22.9
Overweight :	≥23
At Risk	23 – 24.9
Obese I	25 – 29.9
ObeseII	≥ 30

It is not just the amount of fat but also its distribution that determines the risk associated with obesity. Abdominal or visceral fat (android obesity) is associated with the cardiovascular risk factors of the Metabolic Syndrome. These include Type 2 diabetes, impaired glucose tolerance, and hypertension and dyslipidaemia (high triglyceride, low density lipoprotein cholesterol). The visceral fat mass is assessed by the simple clinical measure waist circumference. For Asians the waist

circumference for men≥ 90 cms and in women ≥ 80 cms is associated with increased risk of co morbidities[24].

The waist hip ratio (WHR) is also used as a measure of abdominal obesity. A WHR > 1.0 for men, and WHR > 0.85 for women are used to identify those with abdominal fat accumulation[54.]

In India the increased levels of obesity is primarily associated with the transition from rural to urban lifestyle. However, it is evident that this phenomenon is more profound among the urban populations in comparison to the rural ones[55].Regardless of its cause, obesity may be associated with a variety of risks. Obesity causes or exacerbates many health problems, both independently and in association with other diseases. It is related to the risk for developing non-insulin dependent diabetes mellitus, hypertension, and cardiovascular disease[56]. It also creates an enormous psychological burden. Thus, obesity is associated with a significant increase in morbidity and mortality.

Obesity has also been associated with menstrual dysfunction, reproductive disorders including infertility, increased abortion rates and pregnancy complications and adverse pregnancy outcomes.

Raised BMI also increases the risks of cancer of the breast, colon, prostrate, endometrium, kidney and gallbladder[37]. Chronic overweight and obesity contribute significantly to osteoarthritis, a major cause of disability in adults. Although obesity should be considered a disease in its own right, it is also one of the key risk factors for other chronic diseases together with smoking, high blood pressure and high blood cholesterol. In the analyses carried out for World Health Report 2002, approximately 58% of diabetes and 21% of ischemic heart disease and 8-42% of certain cancers globally were attributable to a BMI above 21 kg/m2.

The growing expenditure on health sector for the Government and the burden of controlling the disease and treating the complications of obesity should be outweighed with the task of prevention.

METHODS AND MATERIALS

1. **Study design**: descriptive cross sectional study.

2. **Study area**: Ponvel pillai thottam (PP thottam) slum of Zone 5 in Chennai.

3. **Study period-** June2009-August 2009

4. **Study population**:

Study population includes women aged 20years and above residing in PP thottam slum.

Antenatal women at the time of study , those who could not be contacted even after two house visits, those on chronic medications that may cause weight gain and who were non cooperative were not included in the study.

4**. Sample size:**

The Sample size was calculated on the basis of 15.6% prevalence rate of obesity among urban slum women in northern India in a study conducted by Misra et al[27] , with allowable error of 20%,using the formula,

$$n = Zalpha^2 \frac{p \times q}{d \times d}$$

n = sample size

confidence factor = Zalpha = $Z_{0.05}$ =1.96

p= 15.6%

q= 84.4%

Limit of accuracy(precision) =20%

d=allowable error =20% of 15.6%

$$n = \frac{1.96 \times 1.96 \times 15.6 \times 84.4}{(20\% \times 15.6) \times (20\% 15.6)}$$

$$\frac{5058.004}{9.7344} = 520$$

Sample size =520

5. **Sampling method**:

Among 10 Zones of Chennai, Zone V was randomly chosen by lottery method. There were 66 slums in Zone V among which Ponvelpillai thottam slum was randomly chosen by lottery method.Ponvelpillai thottam is located in division 67 in Zone V.

Ponvel pillai thottam has a total population of 9089. Total number of women aged 20 yrs and above is 3125.Total number of house holds in PP

Thottam was 1958 (source – updated family register of the PP thottam slum –Shenoy Nagar health post).

In order to get 520 women aged 20 years and above, the number of

households to be surveyed in PP Thottam slum was calculated =1958 x 520 /3125 = 326

The households were sampled by systematic random sampling method. The sampling interval was calculated as follows

Sampling interval = $\frac{\text{total number of households in PP Thottam slum}}{\text{number of households to be surveyed in PP Thottam slum}}$

=1958/326 = 6.

The first sample household was selected randomly by choosing a number (by lottery method) within the sample interval . The next household was identified by adding the sampling interval with the first randomly chosen number . In my study first randomly chosen number was 4, the first household to be surveyed was house no 4. The second household was 4+6=10 ie 10^{th}household. The subsequent household was selected by same method till sample size is reached.

6). Instruments used in data collection

a) Physical instruments

The physical instruments used in this study included portable stadiometer, portable weighing machine and flexible inch tape.

b) **Survey Questionnaire** : Based on WHO guidelines a semistructured questionnaire was constructed. Questionnaire was translated in tamil, pre-tested during the pilot study and standardized.

Part 1 consists of details of socio demographic profile .In part II the question were designed to elicit diet pattern; daily intake of cereals, oil, sugar ;frequency of weekly intake of fruits, vegetables, pulses, milk /milk products and nonveg; type of cooking oil used. Part III questions was designed to elicit about physical activity like duration of house hold activities, nature of job, hours spent at job, exercise, type of exercise, duration of exercise ,sleep hours during night, post lunch sleep and duration of watching television .

Part IV – space to record anthropometric measurements such as height (m), weight(kg) and waist circumference(cms)

7. **Data collection** technique by household survey. Permission to conduct study was obtained from the Director of Institute of Community Medicine,Madras Medical College ;Commissioner of Chennai Corporation; and District Family Welfare Medical Officer, Corporation of Chennai.

The purpose of the study was explained to the respondents after a brief introduction .Willful respondents were interviewed, with questionnaire and information was obtained. After this anthropometric measurements were taken and recorded.

Anthropometric measurements-

The weight of the respondents was measured using the portable weighing scale. The same machine was used throughout the study. The individual was requested to stand still on the platform of weighing machine, with the body weight evenly distributed between both feet. Light indoor clothing can be worn, but with shoes/ footwear removed and the weight is measured. .The scale was also zeroed before weighing and was also caliberated regularly during the study.

Height was measured using a portable stadiometer (Bioplus^{TM}). It was a wall mountable type of stadiometer which has measurement

markings up to 200cm and the same instrument was used throughout the the study. The person whose height has to be measured stands under the body of the stadiometer in an erect position without shoes/footwear with their back against the wall and also asked them to put their feet together and move back until their heels touch the bottom of the wall, the person was also asked to look straight, measuring tip was lowered to the head and the height was measured .

Body mass index (BMI)

Body mass index (BMI) was calculated using the formula,

$$BMI = \text{Weight (in kgs)} \div [\text{Height (in meters)}]^2.$$

Waist circumference was also measured using flexible inch tape.

8. **Data analysis**: data entry was made in excel software in codes and analysis was done using SPSS 11.5 package. Prevalence was expressed in percentage and association with factors was tested for significance using Chi square test. Student t-test was used for comparison of mean values. p value < 0.05 was considered significant.

Operational Definition

WHO Asian Classification was used classify the study population as

Underweight- body mass index <18.5 kg/m^2

Normal range- body mass index 18.5 - 22.9 kg/m^2

Overweight - body mass index $\geq$ 23kg/m^2

Obese - body mass index $\geq$25 kg/m^2

- **Physical activity:** The definition recommended by Exercise Physiology "Energy, Nutrition and Human Performance" was followed to grade physical activity:

Sedentary activity: Person doing less than 2 hours of moderate activity per day.

Moderate activity: Person doing activities like that of walking, cooking, cleaning, cycling, lifting and transporting light weight objects, operating motorized equipment etc. for 2-8 hours and /or doing less than 2 hours of vigorous activity per day.

Vigorous activity: Person doing activities like manual labour without the help of motorized equipment, lifting and transport of heavy weight objects, etc. for more than 2 hours per day or doing moderate activity for more than 8 hours per day.

RESULTS

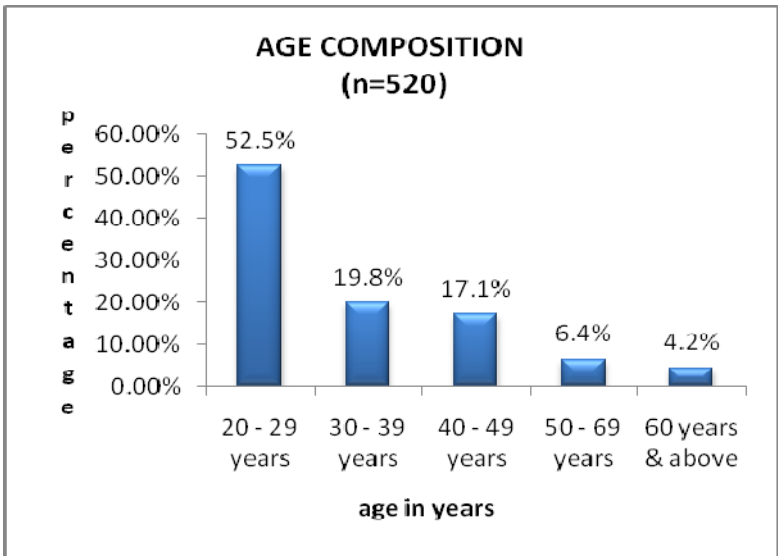
SECTION – A

SOCIO DEMOGRAPHIC PROFILE OF THE STUDY POPULATION

AGE COMPOSITION

Of 520 individuals who participated in the study 52.5% were between 20 – 29years age group, 19.8% were between 30-39 years and 4.2%were 60 years and above. The age composition is shown in Fig -1

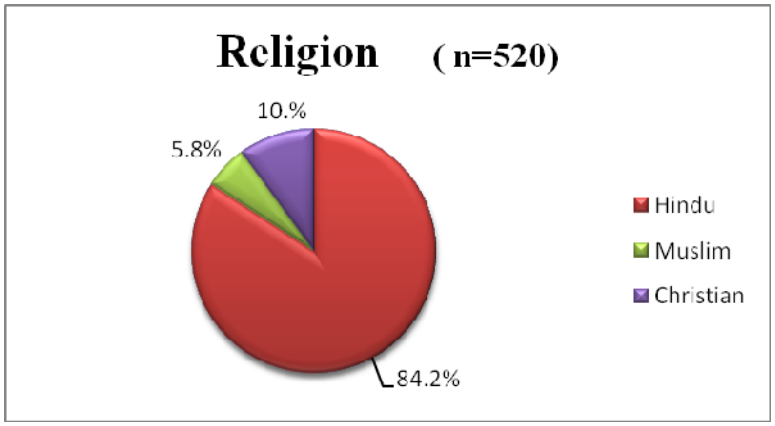
Fig -1



RELIGION

Hindus constituted 84.2% followed by Christians forming 10% and Muslims forming 5.8 % (Fig. 2).

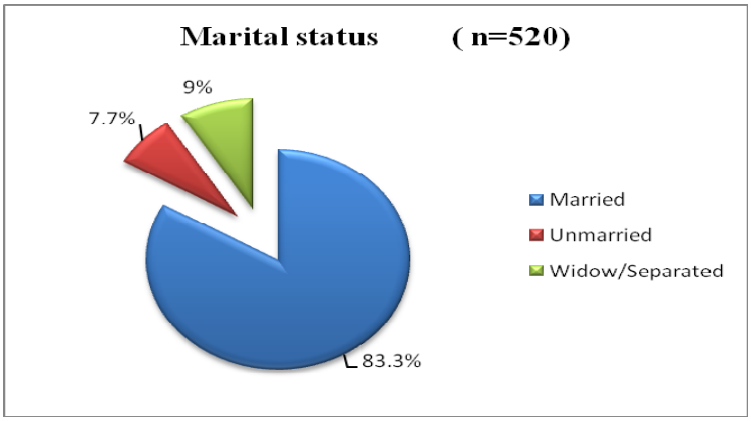
Fig. 2



MARITAL STATUS

Marital status (fig 3) shows 83.3% were married and 7.7% were unmarried. 9% were widow /separated.

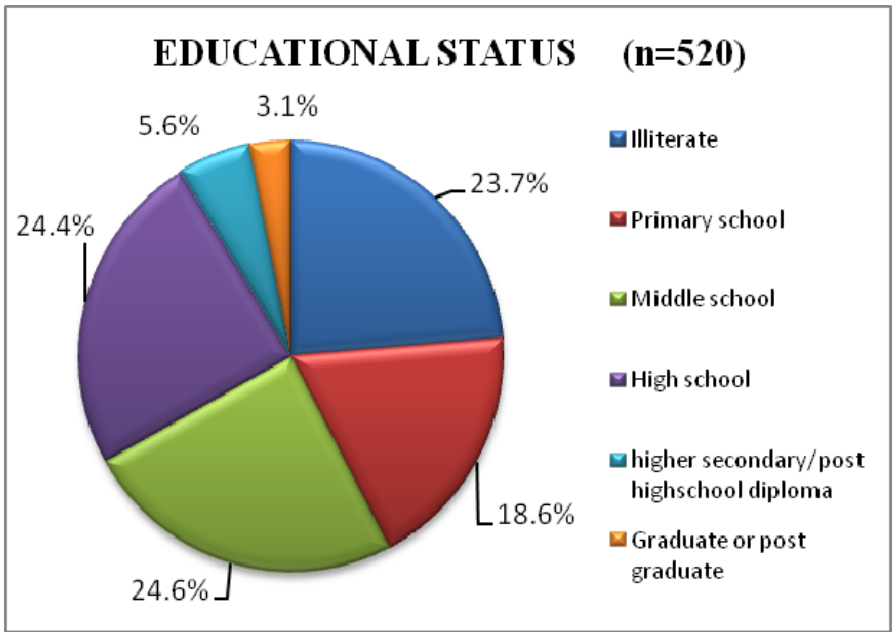
Fig -3



EDUCATIONAL STATUS

23.7% were illiterates, 18.6% had primary school education, 24.6% had middle school education , 24.4% had high school education, 5.6 % had higher secondary education and 3.1% were graduates(Fig -4).The literacy rate was found to be 76.3% .

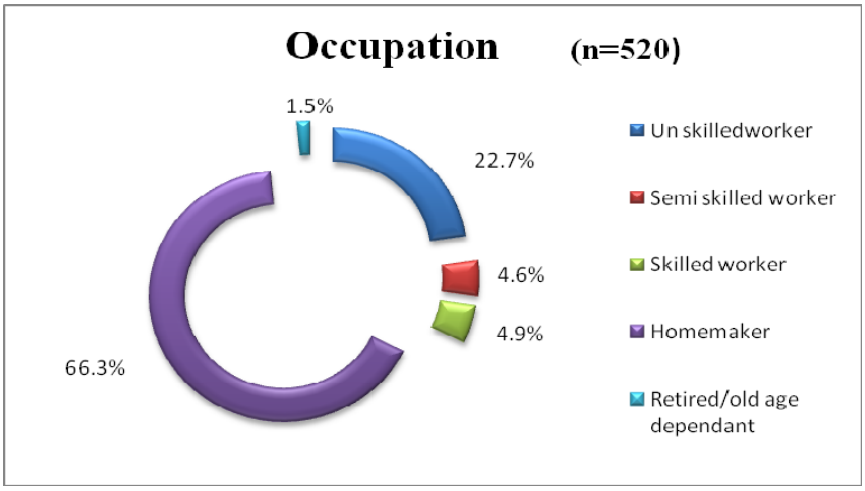
Fig -4



OCCUPATION

In the study population 66.3% were homemakers. 22.7% of the study population were unskilled workers, 4.6% were semiskilled worker, 4.9% were skilled worker and 1.5% retired / old age dependant .Occupational status shown in Fig 5.

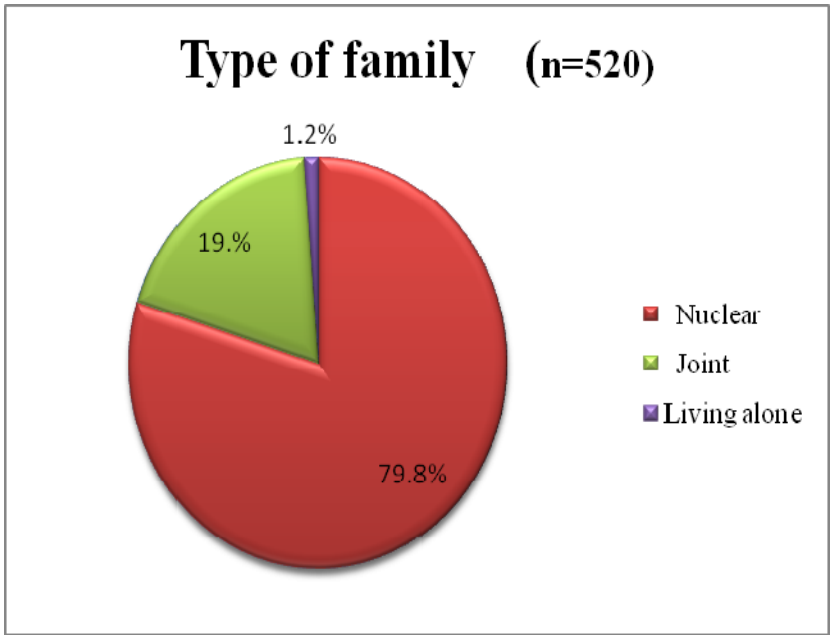
Fig 5



TYPE OF FAMILY

79.8% of the study population belonged to nuclear family ,19% were living in joint family and 1.2% were living alone(Fig 6).

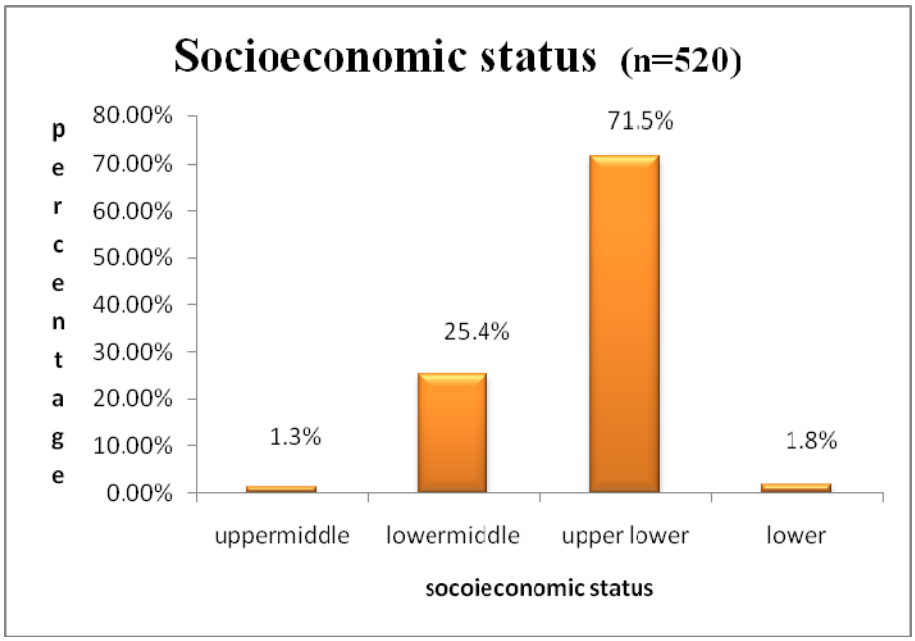
Fig 6



SOCIO ECONOMIC STATUS

Based on Modified Kuppusamy scale the study population was divided into five socioeconomic class. Upper lower class constituted 71.5% followed by lower middle class which constituted 25.4%. The lower class formed 1.8% where as upper middle class formed 1.3%. (FIG 7)

Fig 7



SECTION - B

PREVALENCE OF OVERWEIGHT AND OBESITY

Table-1

Nutritional status (BMI)	**No of Individuals**	**Percentage %**
Underweight (<18.5)	98	18.8%
Normal range (18.5-22.9)	278	53.5%
Overweight(≥ 23) **:**		
At risk (23-24.9)	41	7.9%
Obese I (25-29.9)	65	12.5%
Obese II (≥30)	38	7.3%
TOTAL	520	100%

Of 520 study participants, 98 (18.8%) were underweight, 278 (53.5%) were in the normal range and 144 (27.7%) were overweight. Among the 144 overweight (BMI ≥ 23) individuals, 103were obese (BMI≥ 25).

In the study population the prevalence of overweight (BMI ≥ 23) was 27.7% (95% CI 24.3 - 32.2) and the prevalence of obesity (BMI ≥ 25) was 19.8% (95% CI 16.5-23.6).

In this study, the prevalence of women having waist circumference ≥ 80 cms was 29.9% .

SECTION - C

AGE AND OVERWEIGHT

Table-2

Age group	BMI (kg/m$^{2)}$		Trend Chi square value	p value
	<23 n (%)	≥ 23 (Over weight) n (%)		
20 – 29 years	211 (77.3%)	62 (22.7%)	0.641	0.423
30 – 39 years	59 (57.3%)	44 (42.7%)		
40 – 49 years	65 (73.0%)	24 (27.0%)		
50 – 69 years	24 (72.7%)	9 (27.3%)		
60 years & above	17 (77.3%)	5 (22.7%)		
Total	376 (72.3%)	144 (27.7%)		

The prevalence of overweight was 42.7% i n the 30 -39 years age group. The prevalence was similar around 22.7% in the 20 -29 years age group and in 60 years and above 22.7%.From Table- 2 the trend chi square shows there is no statistical significance (p=0.423) between age group and overweight.

RELIGION AND OVERWEIGHT

Table-3

Religion	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	**≥ 23 (Over weight) n (%)**			
Hindu	310 (70.8%)	128 (29.2%)	4.46	2	0.107
Muslims	22 (73.3%)	8 (26.7%)			
Christians	44 (84.6%)	8 (15.4%)			
Total	376 (72.3%)	144 (27.7%)			

The prevalence of over weight was 29.2% among Hindus, 26.7% among Muslims and 15.4% among Christians .

There is no statistical significance (p=0.107) between religion and overweight (Table 3).

EDUCATIONAL STATUS AND OVERWEIGHT

Table-4

Educational status	BMI (kg/m$^{2)}$		Trend Chi square value	p value
	<23 n (%)	≥ 23 (Over weight) n (%)		
Illiterate	87 (70.7%)	36(29.3%)	41.56	0.000
Primary school	71 (72.2%)	26(26.8%)		
Middle school	85 (66.4%)	43 (33.6%)		
High school	107 (84.3%)	20 (15.7%)		
Higher secondary and Above	26 (57.8%)	19 (42.2%)		
Total	376 (72.3%)	144 (27.7%)		

The prevalence of overweight is 42.2% in higher secondary level of education and above (Table 4). The prevalence was 29.3% among illiterates. The trend chi square shows that prevalence of overweight among different level of education was found to be statistically highly significant (p=0.000).

OCCUPATION AND OVERWEIGHT

Table-5

Occupation	BMI (kg/m$^{2)}$		Chi square value	p value
	<23 n (%)	**≥ 23 (Over wt) n (%)**		
Un skilled worker	90 (76.3%)	28 (23.7%)	8.62	0.071
Semi skilled worker	16 (66.7%)	8 (33.3%)		
Skilled worker	13(52%)	12(48%)		
Homemaker	253(73.3%)	92(26.9%)		
Retired/old age dependant	4 (50.0%)	4 (50.0%)		
Total	376 (72.3%)	144 (27.7%)		

The prevalence of over weight was 26.9% among home makers, 48% among skilled workers, 33.3% among semi skilled workers, 23.7% among unskilled worker and 50% among retired and old age dependant. There is no statistical significance (p=0.071) between the prevalence of overweight and occupation(table 5).

MARITAL STATUS AND OVERWEIGHT

Table-6

Marital status	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	**≥ 23 (Overweight) n (%)**			
Married	311 (71.8%)	122 (28.2%)	0.589	2	0.745
Unmarried	31 (77.5%)	9 (22.5%)			
Widow/Separated	34 (72.3%)	13 (27.7%)			
Total	376 (72.3%)	144 (27.7%)			

There is no statistical significance (p=0.745) between marital status and overweight (Table-6)

FAMILY TYPE AND OVERWEIGHT

Table-7

Family type	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	**≥23 (Overweight) n (%)**			
Nuclear	294 (70.8%)	191 (29.2%)	2.288	2	0.319
Joint	77 (77.8%)	22 (22.2%)			
Living alone	5 (83.3%)	1 (16.7%)			
Total	376 (72.3%)	144 (27.7%)			

The table shows there is no statistical significance (p=0.319) family type and overweight (Table-7)

SOCIO ECONOMIC STATUS AND OVERWEIGHT

Table-8

Socio Economic Status	BMI (kg/m$^{2)}$		Trend Chi square value	p value
	<23 n (%)	≥ 23 (Over weight) n (%)		
Upper Middle	3 (42.9%)	4 (57.1%)	18.25	0.000
Lowermiddle	79 (59.8%)	53 (40.2%)		
Upperlower	286 (76.9%)	86 (23.1%)		
Lower	8 (88.9%)	1 (11.1%)		
Total	376 (72.3%)	144 (27.7%)		

The prevalence of over weight was 57.1% in upper middle class,40.2% in lower middle class,23.1% in upperlower class and 11.1% in lower class. The prevalence of overweight increased as the socioeconomic status increased and was found to be statistically highly significant (p= .000) as shown in Table 8.

PERSONAL HABITS AND OVERWEIGHT

Table-9

Personal habits	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	≥ 23 (Over weight) n (%)			
Betelnut chewing	56 (84.8%)	10 (15.2%)	6.6528	3	0.084
Tobacco chewing	12 (66.7%)	6 (33.3%)			
snuff	6 (60.0%)	4 (40.0%)			
none	302 (70.9%)	124 (29.1%)			
Total	376 (72.3%)	144 (27.7%)			

There is no statistical significance (p=0.084) between the prevalence of overweight and personal habit(Table 9).

MENOPAUSE AND OVERWEIGHT

Table-10

Menopause	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	≥ 23 (Overweight) n (%)			
yes	63 (75.9%)	20 (24.1%)	0.638	1	0.425
no	313 (71.6)	124 (28.4%)			
Total	376 (72.3%)	144 (27.7%)			

There is no statistical significance (p=0.425) between the prevalence of overweight and menopause (Table 10).

NUMBER OF PREGNANCIES AND OVERWEIGHT

Table-11

Number of pregnancies	BMI (kg/m$^{2)}$		Trend Chi square value	p value
	<23 n (%)	≥ 23 (Over wt) n (%)		
None	43 (76.8%)	13 (23.2%)	7.11	0.008
One	70 (74.5%)	24 (25.5%)		
Two	182 (76.8%)	55 (23.2%)		
Three	59 (62.8%)	35 (37.2%)		
more than three	22 (56.4%)	17 (43.6%)		
Total	376 (72.3%)	144 (27.7%)		

The prevalence of over weight was 43.6% among those who were >3 times pregnant followed by those who were 3 times pregnant constituiting 37.2%.There is statistical significance(P=0.008) between overweight and number of pregnancies (Table 11).

FAMILY HISTORY OF OVERWEIGHT

Table 12

Family history of Overweight	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	≥ 23 (Over weight) n (%)			
No	343 (76.4%)	106(23.6%)	27.39	1	0.000
Yes	33 (46.5%)	38 (53.5%)			
Total	376 (72.3%)	144 (27.7%)			

The prevalence of overweight in those who had family history of overweight was 53.5% where as it was 23.6% for those without family history of overweight/obesity and it was found to be statistically highly significant(p=0.000).(Table 12). Women with family history of overweight had 3.72 times higher risk of being overweight than who did not have family history of overweight [OR 3.72 (95% CI 2.22 – 6.23)].

DIET AND OVERWEIGHT

Table 13

Characteristics	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	≥ 23 (Overweight) n (%)			
Diet pattern					
Vegetarian	68 (76.4%)	21 (23.6%)	0.900		0.343
Non-vegetarian	308 (71.5%)	123 (28.5%)		1	
Type of cooking oil					
Saturated	226 (74.8%)	76 (25.2%)	2.30	1	0.130
Unsaturated	150 (68.8%)	68 (31.2%)			
Frequency of vegetables intake					
≥ 3 times / week	337 (72.2%)	130 (27.8%)	0.048	1	0.826
<3 times / week	39 (73.6%)	14 (26.4%)			
Frequency of fruits intake					
≥ 3 times / week	55 (87.3%)	8 (12.7%)	8.05	1	0.005
< 3 times / week	321 (70.2%)	136 (29.8%)			
Total	376 (72.3%)	144 (27.7%)			

STUDENTS T-TEST FOR COMPARISON OF MEAN VALUES

Table -14

Characteristics	BMI (kg/m$^{2)}$		
	<23 Mean ± SD (n=376)	≥ 23 (Over weight) Mean ± SD (n=144)	p value
Intake of cereals gms/day	244.5 ± 28.8	271.8 ± 38.2	0.000
Intake of sugar gms/day	12.5 ± 4.8	17.4 ± 5.2	0.000
Intake of oil ml /day	18.6 ± 6.4	24.4 ± 6.8	0.000

The prevalence of overweight and diet pattern was not found to be statistically significant (p=0.343). Prevalence of overweight among those who consumed fruits < 3 times /week was 29.8% whereas among those who consumed fruits >= 3 times /week was only 12.7% and it was found to be statistically significant(p=0.005). Women who consumed fruits < 3 times/week had 2.91 times higher risk of over weight than who consumed fruits ≥ 3 times / week [OR 2.91 (95% CI 1.35-6.28)].

Prevalence of overweight among those who consume pulses > 4 times/week was 25.5% and ≤ 4 times/week was 32% and was found to be statistically insignificant (p=0.118). Prevalence of overweight among those who consume milk/milk products > 6times/week was 28.7% and ≤ 6 times/week 25.6% and was found to be statistically insignificant (p=0.237). Other factors like type of cooking oil and consumption of vegetables (table 13) in relation to overweight were found to be statistically insignificant. The predominant cereal intake was rice in the study population. The mean cereals, sugar and oil intake (Table 14) among overweight individuals were found to be higher when compared correspondingly to the intake of those who were not overweight and it was statistically highly significant (p=0.000).

PHYSICAL ACTIVITY AND OVERWEIGHT

Table 15

Physical activity	BMI (kg/m$^{2)}$		Trend Chi square value	p value
	<23 n (%)	≥ 23 (Overweight) n (%)		
Sedentary	40 (53.3%)	35 (46.7%)	15.78	0.000
Moderate	310(75.4%)	103 (24.6%)		
Vigorous	5 (76.9%)	1 (23.1%)		
Total	376 (72.3%)	144 (27.7%)		

The prevalence of overweight was 46.7% among those who were sedentary,24.6% among those who were moderately active and 23.1% among those who were vigorously active. The trend chisquare shows (table 15) that as the physical activity level increased from sedentary to vigorous activity the prevalence of overweight decreased and it was statistically highly significant (p=0.000).

SLEEP HABITS

DURATION OF SLEEP AT NIGHT AND OVERWEIGHT

Table- 16

Housrs of sleep /night	BMI (kg/m$^{2)}$		Trend Chi square value	p value
	<23 n (%)	≥ 23 (Over weight) n (%)		
<7	28 (48.3%)	30 (51.7%)	7.59	0.006
7 – 9	340 (76.2%)	106 (23.8%)		
>9	8 (50.0%)	8 (50.0%)		
Total	376 (72.3%)	144 (27.7%)		

The prevalence of overweight was 51.7% among those who had < 7 hours of sleep and 50% among those who slept more than 9 hours in the night and it was found to statistically significant (p=.006) as shown in table 17 .

POST LUNCH SLEEP AND OVERWEIGHT

Table- 17

Post lunch sleep	BMI (kg/m$^{2)}$		Chi square value	df	p value
	<23 n (%)	≥ 23 (Overweight) n (%)			
No	269 (80.8%)	64 (19.2%)	33.2	1	0.000
Yes	107 (57.2%)	80 (42.8%)			
Total	376 (72.3%)	144 (27.7%)			

The prevalence of overweight was 42.8% among those who slept post lunch than who did not sleep after lunch (19.2%) and it was found to be highly statistically significant (p=0.000) as shown in table 18. . Women who slept post lunch had 3.14 times higher risk of being overweight than who did not sleep post lunch [OR 3.14(95% CI 2.11 – 4.67)] .

TELEVISION VIEWING AND OVERWEIGHT

Table- 19

Television viewing(hrs/day)	BMI (kg/m$^{2)}$		Trend Chi square value	p value
	<23 n (%)	≥ 23 (Over weight) n (%)		
>4	21 (44.7%)	26 (55.3%)	30.35	0.000
2 – 4	183 (68.8%)	83 (31.2%)		
<2	172 (83.1%)	35 (16.9%)		
Total	376 (72.3%)	144 (27.7%)		

The trend chisquare shows(table 19) there is a significant increase in overweight as duration of television viewing increased and was found to be statistically highly significant (p=0.000).

DISCUSSION

The study was carried out in an urban slum of Chennai to find out the prevalence of overweight and obesity among women aged 20 yrs and above.

Out of 520 individuals of the study population 144 were overweight and 103 were obese. The prevalence of overweight was 27.7% with the 95% confidence interval of 24.3% to 32.2% . The prevalence of obesity was 19.8% with the 95% confidence interval of 16.5% to 23.6% .This was higher than the prevalence of obesity estimated by Misra et al[27] in females in urban slum population in northern India in 2001 which was 15.6%; (95% CI 10.7-22.3).

The prevalence of overweight was highest (42.7%) in the age group between 30- 39 years. However there was no significant association between prevalence of overweight and age but in a study by Misra et al[27] in urban slum population in northern India in 2001 there was significant increasing trend in prevalence of obesity with advancing age.

The prevalence of overweight was 42.2% in women who had higher secondary level of education and above than illiterate

women(29.3%) and the risk is statistically significant .This is similar to the NFHS -3 [25] where the prevalence of overweight /obesity was higher among women with 12 or more years of schooling than with no education. No statistical significance was there between occupation, religion ,marital status ,type of family and prevalence of overweight. There was no statistical significance between menopause, personal habits and prevalence of overweight.

As the socioeconomic status of the women increased the prevalence of overweight also increased and it was found to be statistically significant. In urban Chennai, Mohan et al [32] reported 20% prevalence of overweight/obesity among men and women aged 20 years and above and belonging to the low socio economic group while, the middle socio economic group had a higher prevalence 35% during 1996-97.

Prevalence of overweight increased as the number of pregnancies increased and was found to be statistically significant (p=0.008). The prevalence of overweight in those who had family history of overweight/obesity was 53.5% where as it was 23.6% for those without family history of overweight/obesity and it was found to be statistically highly significant (p=0.000).According To UW centre for Genomics And

Public Health Mission the risk of obesity increases with family history of obesity.

As the physical activity level increased from sedentary to vigorous activity the prevalence of overweight decreased and it was statistically significant (p=0.000). A five city study group found that sedentary behaviour was significantly associated with obesity compared to non-obese subjects in both sexes, which may be due to greater economic development in cities.[57]In a study conducted in Jammu more number of obese & overweight were found in sedentary workers when compared to moderate& heavy workers, showing a significant association between obesity/overweight and physical activity.[58]

As duration of television viewing increased the prevalence of overweight also increased and was statistically significant.In a study conducted in north India women who regularly watch television are much more likely to be overweight and obese in both Delhi and Punjab.[59]

The prevalence of overweight was 42.8% among those who slept post lunch than who did not sleep after lunch (19.2%) and it was found to be highly statistically significant (p=0.000). The prevalence of overweight was 51.7% among those who had < 7 hours of sleep and 50% among those who slept more than 9 hours in the night and it was found to

statistically significant(p=0.006). A study done in Virginia in 2005 showed that overweight and obese individuals slept less than subjects of normal weight. In 2002, a study of 1.1 million people found that increasing body mass index occurred when habitual sleep amounts fell below 7 to 8 hours. Thirty-nine percent of adults reported sleeping less than 7 h per night in 2002.[60] Chronically reduced sleep times are associated with obesity.[61]

The prevalence of overweight and diet pattern was not found to be statistically significant (p=0.343). Prevalence of overweight among those who consumed fruits < 3 times /week was 29.8% whereas among those who consumed fruits >= 3 times /week was only 12.7% and it was found to be statistically significant(p=0.005).). In a study conducted in urban slum women of Haryana [26] high proportion of respondents reported inadequate intake of fruits and vegetables. Many studies have shown the inverse association between fruit intake and overweight[62]. In a study dietary patterns associated with a high intake of fruits and vegetables among Spanish adults reduce long-term risk of subsequent weight gain and obesity[63]. Other factors like type of cooking oil, consumption of vegetables, pulses and milk/ milk products in relation to overweight was found to be statistically insignificant .The mean cereal ,sugar and oil intake among overweight individuals were found to be higher when

compared correspondingly to the intake of those who were not overweight and it was statistically highly significant(p=0.000). In a study among north Indian women , those who regularly consume high-calorie, high-fat foods tend to be more overweight and obese than other women[59].

SUMMARY

A cross sectional study was carried out in Ponvel pillai thottam slum to find out the prevalence of overweight and obesity among women aged 20 years and above .

The study revealed the following findings:

- The prevalence of overweight was 27.7% with the 95% confidence interval of 24.3% to 32.2% . The prevalence of obesity was 19.8% with the 95% confidence interval of 16.5% to 23.6%

- The prevalence of overweight was highest (42.7%) in the age group between 30-39 years. However there was no significant association between prevalence of overweight and age.

- Women having higher secondary educational status and above had increased prevalence of overweight than illiterate women.

- As socioeconomic status of increased the prevalence of overweight increased and was statistically significant.

- The prevalence of overweight increased as the number of pregnancies increased and was statistically significant.

- The prevalence of overweight in those who had family history of overweight was higher than for those without family history of overweight and it was found to be statistically highly significant.

- Higher prevalence of overweight was found among those women who were sedentary and was found to be statistically significant.

- Women who sleep < 7 hrs and those who sleep> 9hrs had higher prevalence of overweight. Women who sleep after taking lunch were found to be at higher risk of being overweight.

- Inadequate intake of fruits and increased consumption of cereals, sugar and oil was found to be higher among overweight women.

The study concludes that women with higher educational and socio economic status, family history of overweight, higher number of pregnancies, sedentary life style, improper sleep and improper diet are at higher risk of being overweight/obese. Life style modification and healthy diet is essential to prevent the increasing prevalence of overweight and obesity.

LIMITATIONS

1. The study was carried out in only one urban slum.

2. A detailed diet history was not taken and possibility of recall bias cannot be ruled out while eliciting diet history.

RECOMMENDATIONS

- The causes of obesity are complex and the response needs to be multi-faceted. Dietary, physical activity and prevention of sedentary habits programmes should be integral to both the prevention and management of chronic diseases.

- Dietary recommendations

➢ Cutting the amount of fatty , sugary food in diet

➢ consumption away from saturated animal based fats to unsaturated vegetable oil fats

➢ the fibre content in the diet should be increased by consumption of fruits and vegetables, legumes, and nuts .

➢ Creating supportive population-based environments through public policies that promote the availability and accessibility of a variety of low-fat, high-fibre foods.

- For physical activity, individuals should engage in adequate levels throughout their lives. Engaging in daily moderate physical activity for at least 30 minutes is needed.

Maintaining weight within the normal range of BMI throughout adulthood. Mounting a clinical response to the existing burden of obesity and associated conditions through clinical programmes and staff training to ensure effective support for those affected to lose weight or avoid further weight gain.. Environments should be promoted that facilitate physical activity, and supportive infrastructure should be set up to increase access to, and use of, suitable facilities. Reduce the duration of sedentary habits like tv viewing and to engage in physical activity. Clear public messages need to be communicated on the quantity and quality of physical activity sufficient to provide substantial health benefits. School policies and programmes should support the adoption of healthy diets and physical activity. Schools to be encouraged to provide students with daily physical education and should be equipped with appropriate facilities and equipment. Adequate sleep during night about 7-8 hrs and reduction in sleep after lunch should be emphasized.

- Information, education and communication is essential to increase the public awareness and understanding of the relationship between diet, physical activity and health, of energy intake and output, and healthy choice of food items. Simple and clear messages should be prepared and conveyed by

government experts, nongovernmental and grass-roots organizations, and the appropriate industries.

- Governments have a central role, in cooperation with other stakeholders, to create an environment that empowers and encourages behaviour changes by individuals, families and communities, to make positive, life-enhancing decisions on healthy diets and patterns of physical activity. Overweight and obesity impose a significant economic burden on already strained health systems, and inflict great costs on society. Health is a key determinant of development and a precursor of economic growth.

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